Date: March 19th, 2019

to:	from:
Regulatory Certification Body DEKRA Testing and Certification, S.A.U. Parque Tecnológico de Andalucía C/ Severo Ochoa 2 & 6 29590 Campanillas Málaga, Spain	**Silicon Laboratories Finland Oy**, Alberga Business Park, Bertel Jungin aukio 3, Espoo, 02600 Finland

Related to product:

Type of equipment:	Wi-Fi bgn wireless radio module with embedded full stack
Brand name:	Silicon Labs
Model name:	WGM160P22A and WGM160P22N
FCC ID:	QOQWGM160P
IC:	5123A-WGM160P

To whom it may concern,

We hereby declare that we would like to apply for the WGM160P family homologation of Wi-Fi modules, composed by two model names and four variants/ordering codes (2 per model):

Model name	Variant / Ordering part number	With low freq crystal
WGM160P22A	WGM160PX22KGA2	YES
	WGM160P022KGA2	NO
WGM160P22N	WGM160PX22KGN2	YES
	WGM160P022KGN2	NO

The equipment is WLAN Radio module.
All the four variants supports Wi-Fi (802.11 b/g/n) 2.4 GHz, with 20MHz of bandwidth (the device does not support 40MHz bandwidth).

The WGM160P offers two RF ports that supports antenna diversity using an internal switch. The Wi-Fi modules make use of either an integral antenna connected to the primary RF port, or external antennas that can be connected to the primary and secondary RF ports:

Model WGM160P22A:

- RF1: Internal chip antenna (1.86 dBi)
- RF2: External dipole antenna (2.14 dBi)

- Model WGM160P22N:
    - RF1: External dipole antenna (2.14 dBi)
    - RF2: External dipole antenna (2.14 dBi)

The difference between the variants is the presence or not of a low frequency crystal (32.768 kHz), related to the power saving modes of the device.

Thus, this difference is not related to the RF behavior of the equipment.
In regards to the unintentional radiation, the modules equipped with the crystal are considered as the worst case scenario, so we have performed the testing using the most complex models (with crystal):

- WGM160PX22KGA2
- WGM160PX22KGN2

<u>We would like to certify the two model names as a family, under the same FCC ID and IC, without mentioning the four variants/ordering codes in the certificates.</u>

For this, we are submitting the Electrical Diagrams for all four variants (along with the label designs).
We also added a declaration of the manufacturer about the description of the family variants in this letter.

The low frequency crystal of the variant WGM160PX22KGA2 is shown in the Figure 1.

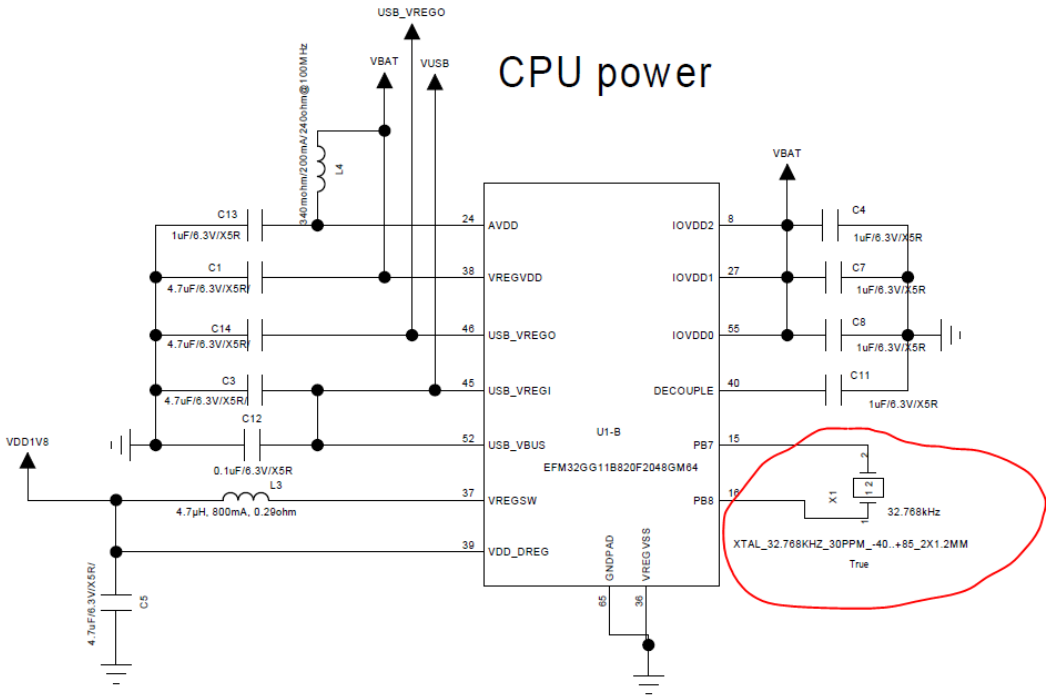
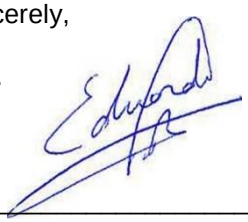


Figure 1 Model WGM160PX22KGA2 with crystal

Sincerely,

P.A.



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Description of WGM160P Variants and of Low Freq Crystal Oscillator Functionality

In the WGM160P family of Wi-Fi modules, four variants exist, and the manufacturing differences are described in the following table:

- Integral chip antenna assembled and connected to primary RF port - 32kHz crystal assembled - Orderable part number: WGM160PX22KGA2 - Known as “A” variant with generic model name: WGM160P22A	- Integral chip antenna not assembled: external antenna(s) required for normal operations - 32kHz crystal assembled - Orderable part number: WGM160PX22KGN2 - Known as “N” variant with generic model name: WGM160P22N
- Integral chip antenna assembled and connected to primary RF port - 32kHz crystal not assembled - Orderable part number: WGM160P022KGA2 - Known as “A” variant with generic model name: WGM160P22A	- Integral chip antenna not assembled: external antenna(s) required for normal operations - 32kHz crystal not assembled - Orderable part number: WGM160P022KGN2 - Known as “N” variant with generic model name: WGM160P22N

A 32.768kHz crystal is connected to the microcontroller inside the module, which contains a low-frequency crystal oscillator being used as the sleep clock for the power saving modes of the module. The microcontroller feeds the buffered 32kHz clock signal to the radio chip which uses it to schedule its sleep periods between RF operation periods.

A variant with the 32.768kHz crystal not assembled in production is provided to reduce the module cost, for customers for whom the power consumption is not as important as the cost. In the variants where the crystal has not been assembled, the software will detect its absence and will configure the microcontroller first, and consequently the radio chipset, to use internal RC clocks for sleep timing. The radio listen periods will be widened too, due to the lower timing precision, with the only side effect of increasing the average current consumption.

All RF operation is correlated to a separate, high precision, thermally compensated, crystal which is connected to the radio chipset, and which is used among others for all precision timings required by the radio communication.
Consequently, nothing that affects radio operation depends on the low frequency crystal. Thus, all the variants with and without the 32kHz crystal are equivalent with regards to the operations as both intentional and unintentional radiators, making it appropriate to only test the modules equipped with the crystal as they represent the most complete solution and the worst case scenario.

The printed circuit board with all the variants is identical, as is the software and all settings.

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